



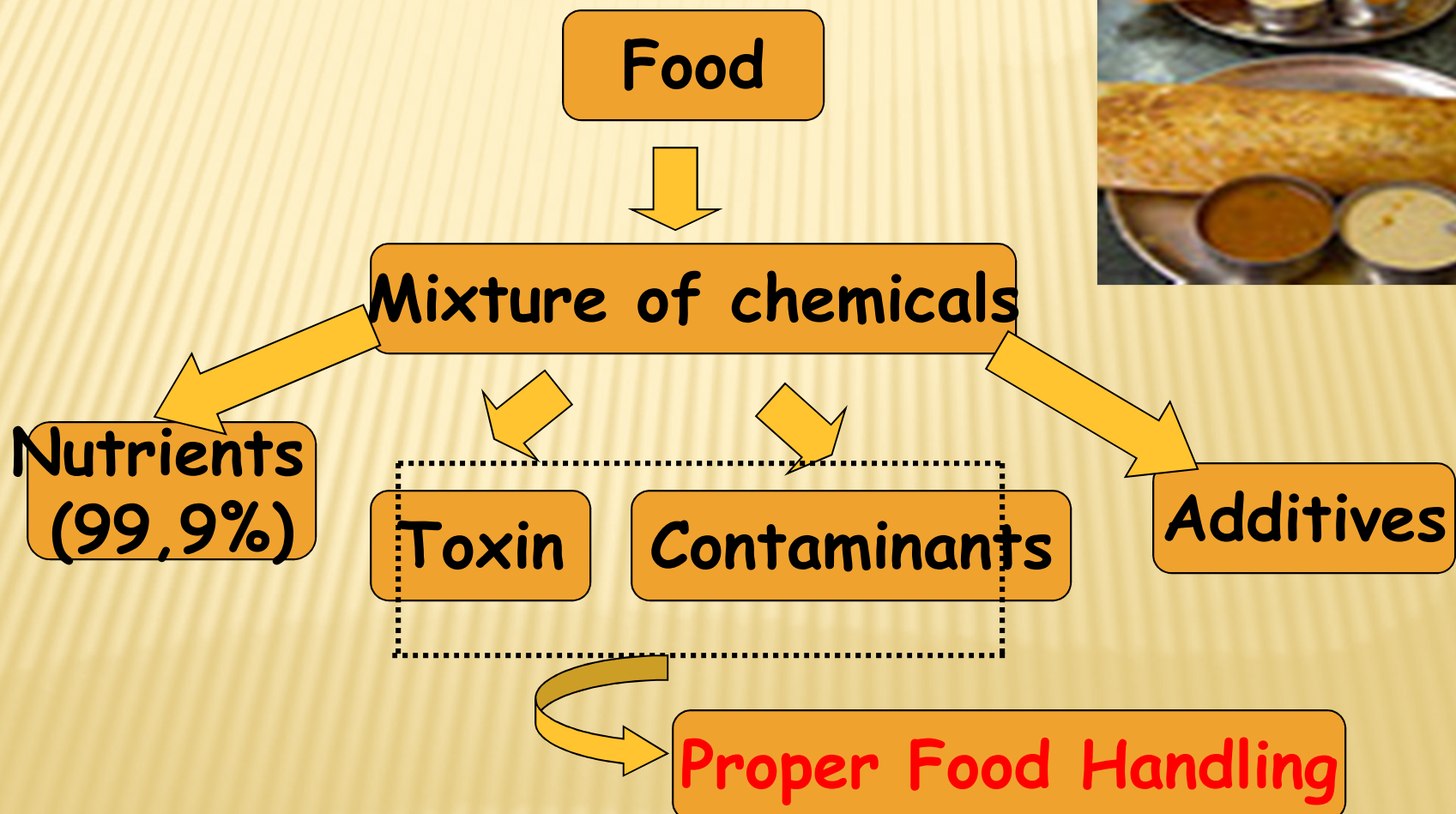
CHEMICALS IN FOOD



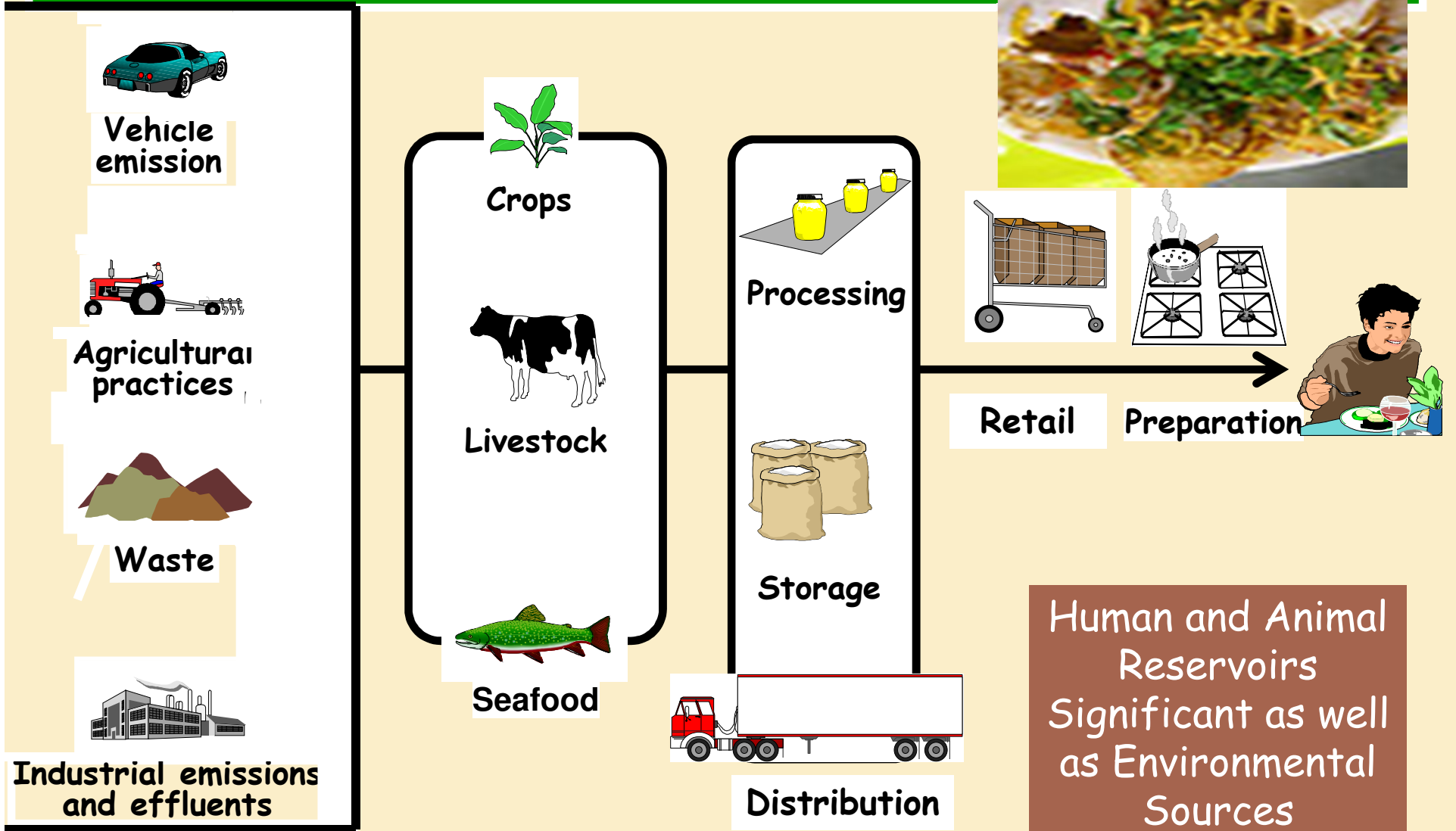
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FOOD

- ✗ Food is fundamental importance to life
- ✗ Human consumes 30 tons of food during his lifetime



Where hazards arise in the food supply



BACKGROUND



- ✘ Typical normal diet contains hundreds of thousands of substances naturally present in food many more which form *in situ* when food is cooked or prepared/stored prior to consumption.
- ✘ Safety of food cannot be proved, instead the safety standards for substances added to food can be no more than a reasonable certainty that no harm will occur.
- ✘ The regulatory framework works on the "Presumption of Safety", unless it contains a harmful substance in an amount to likely harm the health of humans.

BACKGROUND (CONTD.)



- ✘ If there is an ingredient that is added to food by design or a contaminant is present in food, this demands a higher standard of safety.
- ✘ Safety concerns with added substance focus on the nature of the substance and its intended conditions of use.
- ✘ Specifications for added substances depend on the concept of *threshold of regulation* which is an unifying concept in food safety assessment, i.e. there can be a de minimus risk at lower level which is not worth worrying about.

FOOD TOXICOLOGY



- ✘ Substances found in food that might be harmful to those who consume sufficient quantities of the food containing such substances.
- ✘ Substances can be
 - + inherent toxicants
 - + naturally found in foods
 - + contaminants which are from preparation or processing of the foods.

CHEMICALS IN FOOD

- × Naturally occurring
 - + Food constituents - carbohydrates, fats, protein, vitamins, minerals
 - + Natural toxins eg aflatoxin
 - + Other chemicals in food e.g. isoflavones, caffeine, cyanogenic glycosides, methyl eugenol

- × Intentionally added to food
 - + New ingredients eg GM, novel foods
 - + Additives e.g. flavors, sweeteners, colours
 - + Nutrients eg w3 oils, fructose
 - + Vitamins and minerals

 - + Functional ingredients eg ayurveda
 - + adulterants e.g. Melamine

- × Unintentionally added to food (Contaminants)
 - × Environmental e.g. Dioxins/PCB
 - × Process e.g. acrylamide
 - × Food contact materials eg bisphenol A



NATURAL TOXINS IN FOODS

- × **Endogenous toxins of plant origin**
 - Toxic phenolic substances: flavonoids, tannins, coumarin, safrole, and myristicin
 - Cyanogenic glycosides
 - Glucosinolates
 - Acetylcholinesterase inhibitors
 - Biogenic amines
 - Central stimulants
- × **Natural contaminants**
 - Mixing of edible plants with toxic plants
 - Contamination resulting from intake of toxic substances by animals
 - Microbial toxins

UNINTENTIONAL FOOD ADDITIVES

- × Packaging materials
 - BHA/BHT, PCP, polymers, metals
- × Processing chemicals
 - PAH (from cooking), solvents (from extractions)
- × Environmental
 - Natural and anthropogenic
 - Pb, Hg, pesticides, fumigants

WHAT IS FOOD SAFETY?

- ✘ The ways food may become a source of illness: food-borne diseases or food hazards
- ✘ food hazards may have to do with:
 - + food pathogens
 - + environmental contaminants
 - + pesticide residues
 - + food additives
 - + natural toxicants
 - + nutritional imbalance

CATEGORIES OF FOOD ADDITIVES

<ul style="list-style-type: none">• Preservatives<ul style="list-style-type: none">• Antimicrobial• Antibrowning• Antioxidant	<ul style="list-style-type: none">• Flavours<ul style="list-style-type: none">• Flavor enhancers• Sweeteners• Nat/syn flavors
<ul style="list-style-type: none">• Texture<ul style="list-style-type: none">• Emulsifiers• Stabilizers	<ul style="list-style-type: none">• Miscellaneous<ul style="list-style-type: none">• Enzymes• Catalysts• Solvents• Propellants
<ul style="list-style-type: none">• Nutritional<ul style="list-style-type: none">• Vitamins/ Minerals	<ul style="list-style-type: none">• Colours



SCOPE OF FOOD ADDITIVES

- × ~3000 additives
- × ~1800 flavouring agents
- × Texturing agents used in highest quantity
- × Soft drinks are biggest market
- × 4 direct food additives = 93% of total

- Sucrose, salt, corn syrup, dextrose

In EU Sucrose and Salt are classified as food ingredients

PROBLEMS ASSOCIATED WITH DETERMINING THE SAFETY OF FOOD ADDITIVES

- × Absolute safety cannot be proven
- × No protocol is adequate for all compounds
- × Extrapolation from high doses to low dose
- × Extrapolation from animals to man
- × Genetic variation
- × High cost
- × Additives may be safer than the food itself



WHOLE FOODS



Toxicological testing of whole foods in animal models is challenging

- + Complex mixtures
- + Wide variation in composition
- + Impact on dietary balance
- + High dose testing not possible



CONSIDERATIONS FOR ESTABLISHING SAFETY OF DIRECT FOOD ADDITIVES

1. Foods to which the substance is added
2. Level of use in such foods
3. Purpose for which the substance is used
4. Population expected to consume the substance

HOW IS SAFETY ASSURED? - REGULATORY

- × Addition of chemicals to food is controlled by Regulation
 - + May be an over-arching regulation of law requiring manufacturers to ensure that the food they make is safe
 - + Many countries have specific legislation on chemicals in food e.g. additives, contaminants

- × Regulation requires demonstration of safety
 - + Chemical Manufacturer - required to demonstrate safety of that chemical
 - + Safety may be independently evaluated by experts who
 - × advise Regulatory Authorities e.g. EFSA panels, JECFA
 - × advise the food company e.g. GRAS Panel
 - + Pre-approval or authorisation is required before certain chemicals can be added/used in food e.g. additives, pesticides, veterinary drugs, novel foods
 - + Safety reviewed on ongoing basis

INDIA: FOOD SAFETY AND STANDARDS ACT OF INDIA, 2006

- × **MINISTRY OF LAW AND JUSTICE**
(Legislative Department)
New Delhi, the 24th August,
2006/Bhadra2, 1928(Saka)
- × The following Act of Parliament received the assent of the President on 23rd August,
- × 2006, and is hereby published in **No. 34 OF 2006**

INDIA - FOOD SAFETY AND STANDARDS ACT, 2006

- × An Act to consolidate the laws relating to food and to establish the Food Safety and Standards Authority of India for laying down science based standards for articles of food and to regulate their manufacture, storage, distribution, sale and import, to ensure availability of safe and wholesome food for human consumption and for matters connected therewith or incidental thereto.

FOOD ADDITIVE (INDIA)

- × “food additive” means any substance not normally consumed as a food by itself or used as a typical ingredient of the food, whether or not it has nutritive value, the intentional addition of which to food for a technological (including organoleptic) purpose in the manufacture, processing, preparation, treatment, packing, packaging, transport or holding of such food results, or may be reasonably expected to result (directly or indirectly), in it or its by-products becoming a component of or otherwise affecting the characteristics of such food but does not include “contaminants” or substances added to food for maintaining or improving nutritional qualities;

GRAS

- × Generally Recognized as Safe.
- × Scientific experts determine whether a substance that is to be added to a food is GRAS
- × In addition to GRAS the FD&C Act provides a class of substances that are regulated as food additives, which are not GRAS.
 - × Hence, there is legal distinction between GRAS and Food additives.
 - × Under provisions of Sec 406 of the FD&C Act, the quantity of the unavoidable contaminant in food may be limited by regulation.
 - + E.g. Action levels of aflatoxin in ground, grain and milk

GRAS Criteria: Comparing a GRAS Substance to a Food Additive

Food Additive
(Data Exclusivity)

Review &
Approval
by FDA

Evidence
of Safety
(Requires full testing)

GRAS Substance
(Limited Data Exclusivity)

General
Recognition
By Experts

Review &
Approval
by FDA

Widely
known

Consensus

Evidence of Safety
(Requires full testing)

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A.BACALL

**"I don't eat organic foods. At my age I can use all
the preservatives I can get."**

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Thank
you

